

## E. DEVELOPMENT OF TIMBER OPTIONS

As discussed in Section III C, analysis areas in suitable forest lands were delineated in part by three working group identifiers (ponderosa pine, mixed conifer, and lodgepole pine) and by seven existing vegetative condition classes (mature, commercial thin, precommercial thin, reforestation, two-story stands, no treatment, and low site).

These analysis area identifiers depicted stands which were classified as suitable and available lands for timber harvesting. FORPLAN timber management prescriptions were developed for every combination of management emphasis which called for scheduled harvesting and analysis areas which contained suitable and available forested land. For any one prescription, the model was also offered several timing choices for implementation. Also, for each management emphasis and analysis area combination which involved timber harvesting options, the model could select a prescription which called for no program harvesting. This prescription was used as the final economic suitability test.

The silvicultural prescriptions and their associated yield tables developed for these analysis areas were based on: (1) the 1980 timber inventory data for each strata, (2) management objectives, (3) professional judgment of the Forest Silviculturist, and (4) Stand Prognosis runs

The first step was a meeting of the Forest Silviculturist and timber planners to determine what timber option could be used on each site. (Ref. 1920 letter, Prescription Development, March 26, 1982, Letter Notes, April 26, 1982). At this meeting it was agreed that even-aged management would be the most appropriate method of management (although later it was agreed to include uneven-age management in viable alternatives) (See discussion on Harvest Cutting Method Selection, Appendix E.) Also, it was deemed unlikely that the Forest would use the clearcutting regeneration option in the ponderosa pine type. Clearcutting and shelterwood regeneration options would both be allowed in the mixed conifer type and only the clearcutting regeneration option would occur in the lodgepole pine type.

The next step was actual development of the timber prescription and associated yield tables. During this process while working with the timber data base, it was determined that the timbered stands on the Forest were the same, i.e., they were two-storied in nature and for the most part the existing understory could be managed (Ref. Stand Prognosis runs). It was also determined that in the lodgepole pine type two of the strata (mature and two-story) were almost identical, and they were combined (later the lodgepole condition classes for the alternatives were reduced to two: mature sawtimber, and seedlings and saplings). In addition, due to the mountain pine beetle epidemic the only silvicultural options in susceptible lodgepole pine stands were final harvest or do nothing (minimum level).

In addition, special prescriptions were developed for two specific areas of the Forest: visual and riparian management areas. The objectives in these areas were to provide continuous forest cover (i.e., to meet stream-surface shading requirements in timbered riparian areas) and to provide scenic quality and large-diameter trees in the visual zone; both even-aged and uneven-aged timber prescriptions meet the overall objectives of these areas. However, the uneven-aged method, or a modified version, would best meet these objectives in these areas (See Standards for these areas, Forest Plan, Chapter IV, Section F.)

All planting will be done with genetically improved stock. The genetic tree improvement program on the Forest will ensure that genetically-improved stock is maintained in adequate quantities for planting needs. The actual configuration of the timber prescription initially available to the FORPLAN model can be found in Table B-7.

There were no special prescriptions developed for elk winter ranges, because the standard timber prescription met the needs of elk on these lands when used in conjunction with cover constraints.

Further analysis of the timber prescriptions showed that some changes were still needed. The high reliance on overstory removals in mature and two-storied stands was not realistic because some stands would have an understory too old to manage, and too much harvest related damage would occur to the understories of others. Estimates of probable occurrence of these situations were made, and that amount of these stands was given only the final harvest or no-treatment options (see 1920 letter, Unmanageable Understories in Two-storied Stands, March 7, 1983). Further refinement was made to the riparian, visual resources, and overstory removal prescriptions over time, but the basic configuration stayed the same. See Table B-7, Summary of Timber Harvest Prescriptions available to FORPLAN, (Final Version). A final revision to the timber harvesting prescriptions was that salvage operations will be allowed in visual resource foreground areas. The estimate of manageable understories has been updated to reflect current conditions (1989).

#### 1. Financial Analysis (Stage II)

A full range of management options were considered for each analysis area, ranging from the low intensities (i.e., natural regeneration and final harvest) to very high levels of management intensities, with different stocking levels and a number of commercial thins varying from one to four in number. National Forest Management Act regulations require that a financial analysis be performed for management prescriptions applied to the lands which are identified as tentatively suitable for timber production (CFR 219.14(b)). To analyze the economic efficiency of the management options available for individual analysis areas, a FORPLAN run with an objective function of "Maximizing Present Net Value for individual stands with detail" was utilized.

Economic efficiency was evaluated for each of the management prescriptions applied to tentatively suitable lands by determining respective present net values. Present net value was calculated by subtracting the direct costs of growing and harvesting timber from the benefits after discounting both to the present at 4 percent interest rate. The PNV includes the benefits and costs of managing the existing stands as well as future stands in the 150-year analysis period. Benefits are the expected cash and in-kind payments from timber sales. Costs are timber sale planning and administration, timber road construction, reforestation, release, precommercial thinning, and sale area betterment for wildlife, fish, soil, water and livestock. The analysis only considers the benefits and costs of the timber and does not include values and costs for other resources. The assumptions and procedures in FORPLAN (including timber yields and options, management prescriptions, and economic information) are described in this appendix, "Use of Cost Efficiency in Developing Prescriptions", Section III. D. 3.

The present net value of an individual timber stand is determined by many factors which affect the quality of the timber when it is first harvested and the length of time before it can be harvested. First, biological and physical characteristics of the land influence the rate the timber grows, and the size and species of the final stand. Second, management objectives determine the types and timing of management activities which are appropriate to use in the stand. Like the biological and physical factors, the activities influence the rate of growth, the quality of the timber, and when the stand can be harvested.

The biological and physical factors are represented in FORPLAN with different combinations of 3 analysis area identifiers major vegetative groupings, land class delineated by slope, and condition class. Management objectives and activities are modeled in FORPLAN with different management prescriptions. The analysis areas and management prescriptions interact so that each analysis area has a multitude of possible economic values which depend upon the schedule of activities associated with the prescription.

*See pg 115* → The different combinations of management areas and scheduling choices modeled in FORPLAN were evaluated to determine which management scenario would have the highest economic value as measured by present net value. Economic efficiency was also considered in the development of prescriptions before consideration in FORPLAN for a particular analysis area. Those selected for inclusion in FORPLAN were those which represented the goal of the management emphasis in a manner which contributes the greatest to present net value. Table B-5 displays the approximate maximum possible PNV for each working group, land class and condition class.

Analysis of the results indicated that all analysis areas had at least one timber option (i.e., prescription) which resulted in a positive present net value. The prescription which maximizes PNV for all stands is the timber prescription performing initial overstory removal and subsequent shelterwood harvesting within mature and two storied ponderosa pine stands relying on natural regeneration. Present net value is maximized within the mixed conifer stands that are initially treated by overstory removal and later regenerated through clearcutting and planting. In most cases, the PNV is highest when the stand is harvested as soon as possible. The present net value begins to decline when the stand is held beyond the point when timber values per acre grow faster than the 4 percent discount rate. Timber values increase not only when the amount of volume per acre is increasing, but also as the trees increase in diameter.

As a result of public comment, several changes and/or additions were made to the timber prescriptions (See Table B-7, Summary of Timber Harvest Prescriptions Available to FORPLAN, Version applied to alternatives).

The primary substantive change to the Final Environmental Impact Statement that resulted from public comments was in the amount of forested acres which actually had manageable understories. A review was conducted by ranger district personnel to determine more accurately the percentage of manageable understories related to two-story stands in two working groups and major watersheds (see analysis results in Table B-6). The results of this analysis were then applied to the FORPLAN model based on the respective watersheds. This data is for all tentatively suitable acres and is common to all viable alternatives. For details of the process used see the process paper "Manageable Understories Review" (5/10/89).

TABLE B-5

## ECONOMICALLY EFFICIENT MANAGEMENT BY WORKING GROUP/MAX PNV (APPROXIMATE DOLLAR VALUES)

Working Group		Lodgepole Pine		Mixed Conifer		Ponderosa Pine	
Condition Land		Existing Inventory	Managed Inventory	Existing Inventory	Managed Inventory	Existing Inventory	Managed Inventory
Class	Class (% slope)	PNV/Acre	PNV/Acre	PNV/Acre	PNV/Acre	PNV/Acre	PNV/Acre
2 STORY	0-35%	150	50	1,050	250	1,600	350
	36%+	0	0	400	30	1,150	250
COMTHN	0-35%	200	50	550	250	1,050	350
	36%+	0	0	100	0	650	240
MATURE	0-35%	50	0	600	250	1,300	350
	36%+	0	0	150	0	800	250
NOTRET	0-35%	200	40	450	250	650	350
	36%+	0	0	150	0	400	250
OLDGTH	0-35%	150	50	1,050	250	1,600	350
	36%+	0	0	400	0	1,150	250
PRETHN	0-35%	0	50	--	--	250	350
	36%+	--	--	--	--	100	250
REFRST	0-35%	30	50	0	-80	0	350
	36%+	--	--	--	--	--	--
ALLFOR (RIPARN)	0-35%	--	--	--	--	1,500	350
	36%+	250	0	1,050	150	--	--

TABLE B-6

**Proportion of Understory Manageable by Timber Type Across Watersheds**

Watershed	Proportion of Understory Manageable by Timber Type			
	Ponderosa Pine (Acres)		Mixed Conifer (Acres)	
Silvies River	91%	(100,013)	63%	(126,460)
North Fork Malheur	78%	( 16,671)	55%	( 45,052)
South Fork John Day	81%	( 36,538)	87%	( 48,802)
Malheur River	91%	( 35,819)	55%	( 65,955)
Upper John Day	92%	( 18,207)	43%	( 84,684)
Middle Fork John Day	92%	( 20,306)	21%	(121,630)
Fox/Cottonwood	95%	( 4,581)	18%	( 14,052)
Totals (weighted by acres)	89%	(232,135)	49%	(506,633)
Overall weighted average	62% (738,768)			

Public comments also centered on the minimal amount of uneven-aged management planned for the Forest under the Draft Forest Plan. In response to these comments, a prescription was developed to produce ponderosa pine timber volume based on uneven-aged silvicultural management methods (See 2110 letter, *Managed and Regenerated Yield Tables - Uneven-aged/Multistory*, 6/9/88). The developed uneven-aged silvicultural prescriptions were applied to specific management areas.

Other relevant comments focused on the need to consider commercial thinning prescriptions, which was felt to be necessary for stand improvement, during the early decades of the Forest Plan. This prompted a review by timber management personnel of the Prognosis data for commercial thins and no-treatment stands. The review indicated that these stands were structured such that few large diameter overstory trees were present along with many smaller diameter trees in the understory. The harvest of these stands would actually result in a commercial thin, along with the removal of the few larger diameter overstory trees.

Consequently, these type of harvest entries are now being considered as commercial thins, rather than what was formerly termed as overstory removal. This change relates to both commercial thins and no-treatment model components within existing stands of ponderosa pine and mixed conifer. In addition, resulting from the time period which has elapsed from the last inventory to present (ten years), these activities were allowed to occur one decade sooner (See Table B-7, *Summary of Timber Harvest Prescriptions Available to FORPLAN*, Version applied to alternatives).

The last significant change to the prescriptions was to adjust the entry period from three to five decades in the ponderosa pine and mixed conifer two-storied stands (0501 and 0502 model components). This change allowed for a longer period of time for these stands to be entered for harvest.

TABLE B-7

## SUMMARY OF TIMBER HARVEST PRESCRIPTIONS IN FORPLAN (Benchmark Version)

PONDEROSA PINE	MIXED CONIFER	LODGEPOLE PINE
0101 FH only	0201 FH only	0103 (None)
0201 FH only	0202 FH only	0203 FH only
CT-FH	CT-FH	CT-FH
CT-CT-FH	CT-CT-FH	CT-CT-FH
CT-CT-CT-FH	CT-CT-CT-FH	CT-CT-CT-FH
0301 FH only	0302 None	0303 PCT-FH
PCT-CT-FH		PCT-CT-FH
0401 FH only	0402 FH only	0403 FH only
PCT-FH	PCT-FH	PCT-FH
PCT-CT-FH	PCT-CT-FH	PCT-CT-FH
0501 FH only	0502 FH only	0503 FH only
OSR-FM	OSR-FH	
OSR-CT-FH	OSR-CT-FH	
OSR-CT-CT-FH	OSR-CT-CT-FH	
	OSR-CT-CT-CT-FH	
0601 FH only	0602 FH only	0603 FH only
CT-FH	CT-FH	CT-CT-CT-CT-FH
CT-CT-FH	CT-CT-FH	CT-CT-CT-FH
CT-CT-CT-FH	CT-CT-CT-FH	CT-CT-FH
		CT-FH
Common to all of the above	Common to all of the above	Common to all of the above
1 In all stands, FH is a SW	1 In all stands FH are SW or CC	1 In all stands FH is a CC.
2 All OSR include concurrent PCT	2 All OSR include concurrent PCT.	2 All OSR include concurrent PCT.
3 Stands must have OSR take place within three decades of first entry. If this does not happen, then stands will be scheduled for a FH	3 Stands must have OSR take place within three decades of first entry. If this does not happen, then stands will be scheduled for a FH	3 Stand must have a OSR take place within two decades of first entry. If this does not happen, then stands will be scheduled for a FH.
4 Planting with genetically improved stock will take place under SW 36+ slopes. There is a natural regeneration only option for SW on all slopes--on 36+ slopes, a two-decade regeneration period is used for natural regeneration	4. All planting will be with genetically improved stock, planting will take place under SW on slopes 36+ There is also a natural regeneration only option for SW on all slopes--on 36+ slopes a three decade regeneration period is used for natural regeneration.	4 Nonstocked lands will be planted with genetically improved stock. In all other cases, natural regeneration will be relied on

FH = Final Harvest; SW = Shelterwood, OSR = Overstory Removal, PCT = Precommercial Thin; CT = Commercial Thin, CC = Clearcut; Riparian = All timber prescriptions will be the same as above; Visuals = Ponderosa pine - Uneven-aged management, entry every three decades, no salvage between entries; Mixed Conifer - Uneven-aged management, entry every two decades, no salvage between entries, Lodgepole pine - Same as above (timber).

TABLE B-7 (Continued)

## SUMMARY OF TIMBER HARVEST PRESCRIPTIONS AVAILABLE TO FORPLAN (Version applied to alternatives)

PONDEROSA PINE		MIXED CONIFER		LODGEPOLE PINE	
0101 FH only	*	0201 FH only	*	0103 (same as 0503)	
OSR-FH		SE-SE-....			
OSR-CT-FH					
SE-SE- ...					
0201 FH only		0202 FH only		0203 (Same as 0503)	
CT-FH		CT-FH			
CT-CT-FH		CT-CT-FH			
CT-CT-CT-FH		CT-CT-CT-FH			
SE-SE- ..		SE-SE-.....			
0301 PCT-FH		0302 None		0303 PCT-FH	
0401 FH only		0402 FH only		0403 (same as 0303)	
PCT-FH		PCT-FH			
PCT-CT-FH		PCT-CT-FH			
0501 FH only		0502 FH only		0503 FH only	*
OSR-FH	*	OSR-CT-FH	*	CT-FH	
OSR-CT-FH	*	OSR-CT-CT-FH	*	CT-CT-FH	
OSR-CT-CT-FH	*	OSR-CT-CT-CT-FH	*	CT-CT-CT-FH	
SE-SE- ...	*	SE-SE-... ..	*		
0601 FH only		0602 FH only		0603 (Same as 0303)	
CT-FH		CT-FH			
CT-CT-FH		CT-CT-FH			
CT-CT-CT-FH		CT-CT-CT-FH			
SE-SE- ..		SE-SE-.....			

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|---|--|--|
| <p>1. In all stands, FH is SW.</p> <p>2. 60 Percent of all OSR have a PCT at the time of OSR.</p> <p>3. Stands must have OSR take place within five decades of first entry. If this does not happen, then stands will be scheduled for a FH</p> <p>4. All planting will be accomplished with genetically improved stock. There is a SW with interplanting option, available for slopes <math>\geq</math> 36 percent, as well as a SW natural regeneration only option. There can be up to a two-decade total regeneration period.</p> <p>5. Selection harvest will be available in all model components, and will emphasize ponderosa pine.</p> | <p>1. In all stands, FH are SW or CC</p> <p>2. 60 Percent of all OSR have a PCT at the time of OSR.</p> <p>3. Stands must have OSR take place within five decades of first entry. If this does not happen, then stands will be scheduled for a FH</p> <p>4. All planting will be accomplished with genetically improved stock. There is a SW with interplanting option, available for slopes <math>\geq</math> 36 percent, as well as a SW natural regeneration only option. There can be up to a two-decade total regeneration period.</p> <p>5. Selection harvest will be available in all model components, and will emphasize ponderosa pine</p> | <p>1. In all stands FH is a CC.</p> <p>2. 60 Percent of all OSR have a PCT at the time of OSR.</p> <p>3. Stands must have OSR take place within three decades of first entry. If this does not happen, then stands will be scheduled for a FH.</p> |
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The following page has an explanation of the acronyms and symbols used in Table B-7.

TABLE B-7 (Continued)

SUMMARY OF TIMBER HARVEST PRESCRIPTIONS AVAILABLE TO FORPLAN (Version applied to alternatives)Additional prescriptions

Riparian	All timber prescriptions will be available as above, plus uneven-aged management, as in visual resources (Lodgepole pine - Uneven-aged management entry every four decades )
Visual Resource	Ponderosa pine - Uneven-aged management, entry every three decades. Mixed Conifer - Uneven-aged management, entry every two decades Lodgepole pine - Same as above (timber).
Low site	Uneven-aged management, entry every four decades

Acronyms and symbols

FH = Final Harvest, SW = Shelterwood; OSR = Overstory Removal, PCT = Precommercial Thin; CT = Commercial Thin; CC = Clearcut, SE = Selection (uneven-age), <35% only

\* = Prescriptions used for updating for harvests in the 1980-89 period

## F. DEVELOPMENT OF YIELD COEFFICIENTS

### 1. Timber

Timber yield coefficients were developed from a Forest timber inventory completed in 1980. The inventory data were processed in a computer model called Stand Prognosis for Managed and Regenerated Yield Tables and, at the Regional Office for the existing situation, Empirical Yield Tables. These models predict yields over time for each timber strata, based on existing volume, age, growth rates, and specific management activities. Other yield tables were also developed using the above data and applying professional knowledge or accepted statistical methodology to get desired results again for Managed and Regenerated Yield Tables (1920 letter, August 13, 1982 Processing Criteria - Empirical and Managed Yield Tables; 1920 letter, August 15, 1982, Malheur National Forest Timber Management Yield Tables; 1920 letter, June 4, 1985, Managed Yield Tables, Uneven-aged Management - Visuals, 1920 letter, September 28, 1984, Timber Yield Tables <20 ft<sup>3</sup>/ac/yr (low site).) All of these coefficients were adjusted to give net values for timber production (1920 letter, May 28, 1982, Adjustment to Yield Tables), with the exception of low-site and empirical yield tables which were net values to start with. Further adjustments were also made to fit these yield coefficients into the FORPLAN computer model (Notes, Error in FORPLAN "Free-Form" Timber Yield Tables used for Overstory Removals (OSR), December 11, 1985). These tables were adjusted to the year 1987, on the assumption that that year would be the mid-point of the first decade of the plan.

Resulting from public comments prompting changes to the Final Environmental Impact Statement, new yield tables were developed for uneven-aged management (2410 letter, June 9, 1988, Managed and Regenerated Yield Tables - Uneven-aged/multistory). These tables were then used in FORPLAN analysis for application in the general forest management areas.